CHAPTER 10: CRITERIA FOR EVALUATING MATHEMATICS INSTRUCTIONAL MATERIALS

Instructional materials that are adopted by the state help teachers present the content set forth in the Mathematics Content Standards for California Public Schools (referred to in this document as the "California Mathematics Standards"). To accomplish this purpose, this chapter establishes criteria for evaluating the instructional materials for the six-year adoption cycle beginning with the primary adoption in 2007. These criteria serve as evaluation guidelines for the statewide adoption of mathematics instructional materials for kindergarten through grade eight, as defined in Education Code Section 60010. Although not part of the criteria for evaluating instructional materials, beginning with the 2007 K-8 Mathematics Primary Adoption (pursuant to Assembly Bill 2532 - Chapter 1096, Statutes of 2002), textbook publishers will be required to provide a lighter-weight textbook option that districts may purchase (such as split volumes, electronic editions, or classroom sets), if their textbooks are not within the SBE approved maximum textbook weight standards for elementary and secondary school textbooks (Grades K-4: three pounds; Grades 5-8: four pounds; Grades 9-12: five pounds). More information about the implementation of these weight standards will be included in the *Invitation to Submit* document for publishers.

The California Mathematics Standards are rigorous. Instructional materials play a central role in assisting students to achieve the standards. The mathematics content standards are organized by grade level from kindergarten through grade seven and are presented in five strands: Number Sense; Algebra and Functions; Measurement and Geometry; Statistics, Data Analysis, and Probability; and Mathematical Reasoning. However, there is no requirement that publishers adhere to this strand organization as long as they address all the individual standards. In addition, the

order of the mathematics standards does not imply a required organization for the materials within a grade level or discipline. Instructional materials may group related standards and address them simultaneously for purposes of coherence and utility.

The standards for grades eight through twelve are organized differently from those for kindergarten through grade seven. Mathematics in the higher grades is not organized by strand because the mathematics studied in grades eight through twelve falls naturally under the disciplines algebra, geometry, and so forth. Local educational agencies and teachers have flexibility in planning courses of study as the standards for grades eight through twelve do not mandate that a particular discipline be initiated and completed in a single grade. Most schools teach the disciplines in traditional courses; others teach the material in an integrated program.[1] The content of each of the disciplines must be covered, and students are expected to achieve the standards regardless of the sequence of the disciplines. Thus the content covered in an integrated program that combines Algebra I, geometry, and Algebra II must be the same content that is covered in traditional courses for those disciplines.

The acquisition of mathematical reasoning is intrinsically entwined in the learning and the doing and the understanding of a particular portion of the mathematics content. Therefore, the standards under the Mathematical Reasoning strand are to be addressed not in isolation but by and through the presentation of content listed under the other strands.

Instructional materials adopted by the California State Board of Education, on the whole, should provide programs that will be effective for all students—those who have mastered most of the content taught in the earlier grades and those who may

[1] If a publisher submits an integrated program for grade eight, the entire program series must be submitted (e.g., to evaluate a three-year integrated Algebra I/geometry/Algebra II series, materials for all three years of the program would be reviewed to determine alignment with the Algebra I standards).

have significant gaps in learning. In addition, instructional materials must specifically address the needs of teachers who instruct a diverse student population. Publishers should select research-based pedagogical approaches that give teachers effective alternatives in teaching mathematics. Guidance on evaluating educational research can be found in the report entitled "Identifying and implementing educational practices supported by rigorous evidence: A user friendly guide" (US Department of Education (2003). [2]

The criteria ask for instructional materials that address the learning needs of students and require programs to be submitted in one of three categories: **basic grade-level, intervention,** and **algebra readiness**. Districts will decide, based on individual assessment data, whether each student uses one or a combination of basic grade-level, intervention, or algebra readiness materials. Regardless of the type of program, instructional materials must provide all students with access to the concepts, skills, and problem-solving tools described in the California Mathematics Standards.

Student Access

The framework outlines a strategy for successful diagnostic teaching by recommending instructional assistance designed to help all students, including struggling students, learn the key concepts in mathematics well so that they develop a foundation on which further mathematical understanding can be built (defined in Chapter 6 of the *Mathematics Framework for California Public Schools*). The descriptions provided below are intended to give publishers a correlation between

[2] U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance (2003) Identifying and implementing educational practices supported by rigorous evidence: A user friendly guide.
http://www.ed.gov/rschstat/research/pubs/rigorousevid/index.html

the learning needs of students (defined in Chapter 6 of the *Mathematics Framework*) and the three types of submissions appropriate to use with students:

Benchmark Students

These students are making good progress toward the standards but may be experiencing temporary or minor difficulties. Student needs must be addressed quickly, often by reteaching concepts in a different way. These students typically participate in a **basic grade-level program**.

Strategic Students

Some students may be a year below grade level. They can be brought to grade level by the regular classroom teacher, but their difficulties must be examined systematically and fully. These students may also need to take two periods of mathematics a day to master the content of the standards. Generally, these students participate in a **basic grade-level program with additional support**.

Intensive Students

Some students are at serious risk of not meeting the standards, as indicated by the students' repeated low performance on valid and reliable measures. Generally, these students are performing two or more years below grade level. Intensive intervention and extended instructional time will be required. These students require an **intervention program** that focuses on foundational skills and concepts essential for students to succeed in a basic grade level mathematics program. The program should not serve as a fixed-term course since the intent is for students to accelerate their achievement so that they can be successful in the basic grade level program.

Three Types of Programs

Three types of programs will be considered for adoption: basic grade-level (kindergarten through grade eight), intervention (grades four through seven), and algebra readiness (grade eight). All three types of programs must be stand-alone products and will be reviewed separately.

Basic Grade-Level Program (Kindergarten Through Grade Eight)

The basic grade-level program is the comprehensive mathematics curriculum for students in kindergarten through grade eight. It provides the foundation for instruction and is intended to ensure that all students master the California Mathematics Standards. This comprehensive curriculum should provide instructional content for time periods of at least 50 minutes per day. In addition to the basic material that is provided to cover the standards for students who are achieving at or near grade level (benchmark level), there should be instruction to support the learning of students who are at the strategic level. Instruction suitable for advanced learners should be included in a basic grade-level program as well.

Intervention Program (Grades Four Through Seven)

Students who have significant gaps in their knowledge of mathematics may benefit from a mathematics intervention program. These programs contain materials that teachers can use to support instruction in six topical volumes as described in Appendix E, “Mathematics Intervention and Algebra Readiness Instructional Materials.”

Algebra Readiness Program (Grade Eight or Above)

Although those students who have mastered the content described in the California Mathematics Standards for kindergarten through grade seven will be ready to take Algebra I in grade eight, other students will not have the necessary preparation and will not be ready for algebra. Those who are not prepared to take an algebra course in grade eight will require specialized instructional materials that focus on the prerequisite standards described in Appendix E, "Mathematics Intervention and Algebra Readiness Instructional Materials." Algebra Readiness instructional materials must be designed to serve students for a full year of instruction, however schools may use the materials in a different instructional settings. Algebra readiness programs prepare students for success in Algebra I.

Valid and reliable curriculum-embedded diagnostic assessments must be provided that inform the teacher of areas of students' strengths and weaknesses. Instruction that is based on the requisite standards, coupled with the information obtained from the assessments, should prepare students for algebra.

Evaluation Criteria

The criteria for the evaluation of mathematics instructional resources for kindergarten through grade eight are organized into five categories (these categories apply to all three program types).

1. **Mathematics Content/Alignment with the Standards**. The content as specified in the California Mathematics Standards and presented in accord with the guidance provided in the *Mathematics Framework for California Public Schools*
2. **Program Organization**. The sequence and organization of the mathematics program that provide structure for what students should learn each year in

basic programs and for the duration of algebra readiness and mathematics intervention programs

3. **Assessment**. The strategies presented in the instructional materials for measuring what students know and are able to do
4. **Universal Access**. Instructional materials that address the needs of special student populations, including students eligible for special education, students whose achievement is either significantly below or above that typical of their class or grade level, and students with special needs related to English language proficiency
5. **Instructional Planning and Support**. The instructional planning and support information and materials, typically including a separate teacher's edition to help teachers in implementing the mathematics program

Materials that fail to meet the criteria for Mathematics Content/Alignment with the Standards will not be considered satisfactory for adoption. Only those programs determined to meet all criteria in category 1 and that have strengths in each of categories 2 through 5 will be deemed worthy of adoption. Unless otherwise noted, the following information in categories 1 through 5 applies to all three program types.

Category 1: Mathematics Content/Alignment with the Standards

Mathematics materials should support teaching to the California Mathematics Standards, in accord with the guidance provided in the *Mathematics Framework for California Public Schools.* Instructional materials suitable for adoption must satisfy the following criteria:

1. The mathematics content is correct, factually accurate, and written with precision. Mathematical terms are defined and used appropriately.

2. The materials in basic instructional programs support comprehensive teaching of the California Mathematics Standards at each grade level as detailed, discussed, and prioritized in chapters 2 and 3 of the *Mathematics Framework.* The materials in algebra readiness and mathematics intervention programs support comprehensive teaching as detailed in Appendix E. So that the mathematics all students should know and be able to do is clear, the only standards that may be referenced in any program are the California academic content standards developed under *Education Code* Section 60605, and the instructional design must reflect current and confirmed research. The materials must not conflict with the California Mathematics Standards or the *Mathematics Framework*.
3. The attention given to each standard in the basic program is in accord with its level of emphasis in Chapter 3 of the *Mathematics Framework.* Appendix E contains guidance for algebra readiness and mathematics intervention instructional materials.
4. Mathematical topics are presented at broadly different levels of rigor and are written to bring students to the level of proficient or advanced performance (materials for advanced learners are not required for intervention programs).
5. For the basic program, a substantial majority of the content relates directly to the California Mathematics Standards for each grade level although standards from earlier grades may be reinforced, and a foundation for the mastery of later standards must be built at each grade level. For the intervention and algebra readiness programs, a substantial majority of the content relates directly to the subset of California Mathematics Standards selected for those programs (see Appendix E), and the foundational concepts and skills that are necessary for student proficiency on these standards.

6. All content must be clearly relevant to mathematics. Unrelated topics that are not directly focused on the California Mathematics Standards and the *Mathematics Framework* are kept to a minimum.
7. A checklist of California Mathematics Standards is included in the teacher's guide together with page number citations or other references that demonstrate alignment with the California Mathematics Standards and, to the extent possible, the *Mathematics Framework.* Material referenced to show alignment with a standard in the Mathematical Reasoning strand should also be aligned with one or more standards outside that strand.
8. Concepts and procedures are explained and are accompanied by examples to reinforce the lessons. **All formulas and theorems appropriate to the grade must be proven; informal or heuristic proofs are acceptable if a complete proof is provided in a later lesson or grade within the program**. Students are provided with sufficient material so that they may develop a complete understanding of the mathematical concepts and reasoning skills outlined in the California Mathematics Standards.
9. Many mathematical problems are provided to help develop automatic use of procedures and foster the development of mathematical understanding. Strategies for solving various classes of problems are provided. The types of problems include those that:

- Help students develop and understand a concept.
- Provide practice in learning a skill.
- Provide practice with mental calculations.
- Provide practice with written calculations.
- Involve routine single-step calculations.
- Involve multistep procedures.

- Require a mathematical proof.
- Are mathematically interesting and challenging.
- Provide opportunities for mathematical, logical reasoning.
- Are applications of previously learned mathematics.

10. Applications of the mathematics must be clearly marked as such and must not be equated with the mathematics itself or dictate the scope and sequence of the mathematics program.
11. Materials drawn from other subject-matter areas are scholarly and consistent with the currently adopted California curriculum framework for that subject-matter area at the appropriate grade level.
12. Intervention programs are designed to accelerate students' progress in mathematics in the shortest possible time so that they can begin to make progress using the basic grade-level programs. To serve this purpose, intervention programs must provide targeted and explicit instruction on the subset of mathematics standards indicated in Appendix E and be free of unrelated or unnecessary content. See "A Mathematics Intervention Program (Grades Four Through Seven)" in Appendix E for further explanation.
13. Algebra readiness programs must target the specific subset of sixteen mathematics standards indicated in "Algebra Readiness (Grade Eight or Above)" in Appendix E by addressing the foundational concepts and skills from earlier grades and breaking each of the sixteen standards into component concepts and skills. At a minimum, materials must address foundational skills and concepts that develop fluency with: operations on whole numbers; representing fractions, mixed numbers, decimals, and percentage; operations on positive fractions; use of symbols to express verbal information; writing and solving simple linear equations; plotting points, interpreting ordered pairs from

a graph, and interpreting lengths of horizontal and vertical line segments on a coordinate plane; and graphing and interpreting relationships of the form *y=mx*. The foundational skills and concepts must be addressed repeatedly, building in depth and complexity and providing perspective and distributed practice.

Category 2: Program Organization

The sequence and organization of the mathematics program provide structure to what students should learn each year and allow teachers to convey the mathematics content efficiently and effectively. The program content is organized and presented in a manner consistent with the guidance provided in the *Mathematics Framework.* To be considered suitable for adoption, instructional materials in mathematics must provide these essential components:

1. For the basic program, materials for each grade are developed in logical order and increase in depth and complexity during each school year and from grade to grade. Materials for each grade are organized around the key topics presented in Chapter 3 of the *Mathematics Framework.* For the intervention programs, materials must be organized around the six volumes specified in Appendix E, and the indicated subset of standards. No specific order of topics within these volumes is required, and volumes may be split into smaller units for publication. For the algebra readiness programs no specific order of topics is required, however, materials must be organized so that foundational skills and concepts can be assessed and taught, as needed, before teaching the subset of sixteen Grade 7 and Algebra I standards specified in Appendix E.
2. Concepts are developed in a logical order and increase in depth and complexity. The scope and sequence of the materials are presented in the following manner:

- New concepts are introduced at a reasonable pace, and there are sufficient instructional and practice materials on all the important topics.
- The order in which topics are presented is mathematically and pedagogically sound.
- Prerequisite skills and ideas are presented before the more complex topics that depend upon them.
- Mathematical content and instructional activities are sequenced to prevent common student misconceptions.
- The connections between related topics are taught after each topic has been separately introduced to prevent confusing the two, and the organization of the material supports the understanding of these connections.
- Student materials contain guidance to help build understanding of a topic, including references to earlier sections of the instructional program and summative reviews.
- Repetition and review are used to develop automaticity or to prepare for further learning.
- Computational and procedural skills, conceptual understanding, and problem solving are interconnected and are included throughout the program.
- Mathematical discussions are brought to closure. An example of a lesson brought to closure is one in which solutions to problems are complete and what a student should have learned has been summarized; or when any new concepts and definitions have been discussed and emphasized; or when the demonstration of a new theorem has been completed or, if postponed, students know when it will be completed and have an indication of what will be involved.

3. Materials for teachers and students contain an overview of the chapters that clearly identifies the mathematical concepts. Materials shall include tables of contents, indexes, and glossaries containing important mathematical terms.
4. Materials must provide for individual study, in addition to classroom instruction, and for practice and tutoring outside the classroom.
5. Those support materials provided, such as electronic learning resources or manipulatives, are an integral part of the instructional program and are clearly aligned with the California Mathematics Standards and the *Mathematics Framework.*
6. For grades four through eight, the relevant grade-level standards shall be explicitly stated in both the teacher and the student editions.

Category 3: Assessment

Instructional materials, following the guidance provided in Chapter 5 of the *Mathematics Framework,* should contain strategies and tools for continually measuring student achievement. To be considered suitable for adoption, instructional materials in mathematics must provide these essential components:

1. In the basic and algebra readiness programs, guidance for the teacher in assessing each student's level of achievement at the beginning of the school year. This initial assessment should be comprehensive and help the teacher determine whether the student needs additional materials and resources to achieve the grade-level standards or intervention materials that reteach concepts and skills that should have been mastered previously. In the algebra readiness and the intervention programs, the entry-level assessments should identify which students need the program and should identify their existing strengths and weaknesses.

2. Questions to monitor student comprehension during instruction.

3. Sufficient content background information for teachers.

4. Assessments, such as lesson quizzes, chapter and unit tests, which have valid content and measure individual student progress both at regular intervals and at strategic points of instruction. The assessments are based on research and are designed to:

   - Measure each student's skills and knowledge.
   - Monitor student progress toward meeting the standards.
   - Provide summative evaluations of individual student achievement.
   - Identify students who are not making reasonable progress.
   - Monitor conceptual understanding, basic skills and procedures, and problem-solving ability.
   - Monitor student reasoning, from informal explanations to formal proofs.
   - Provide multiple methods of assessing what students know and are able to do.
   - Help the teacher determine the effectiveness of instruction.
   - Help the teacher keep parents and students informed about student progress.

5. Suggestions on how to use assessment data to guide decisions about instructional practices and how to modify an instructional program so that all students continually progress toward meeting or exceeding the standards.
6. In the intervention program, frequent diagnostic assessments to tailor instruction to the standards with which students are having difficulty. The program should include an initial assessment to determine program placement (e.g., referenced to the six volumes and/or sections within each volume to be

used), diagnostic assessments to identify areas of strengths and weaknesses, formative assessments to demonstrate student progress toward meeting identified benchmarks, and a summative assessment to determine whether a student has mastered the materials. For example, Grade 2 Number Sense Standard 2.2 (Find the sum or difference of two whole numbers up to three digits long) involves both addition and subtraction and covers a range of component concepts and skills. Assessments on this standard should identify whether student difficulty is due to lack of understanding of place value, knowledge of basic facts, regrouping (carrying or borrowing) errors, keeping the digits in place-value columns, etc. In this and other cases, diagnostic assessment should be informed by the types of errors students are apt to make in each content area. Teachers' editions should help educators select and use assessment tools that provide student data to meet their instructional needs. All materials should include information and strategies for making the lessons accessible to all categories of special needs students.

7. In the algebra readiness program, extensive diagnostic assessments on the foundational concepts and skills from earlier grades, as indicated in Appendix E, that can be used to guide instruction. For the sixteen specified standards that make up the program, there must also be extensive diagnostic assessments to guide instruction on the standards, and the component concepts and skills.

Category 4: Universal Access

Students with special needs must be provided access to the same academic standards-based curriculum that is provided to all students, as set forth in Chapter 6 of the *Mathematics Framework.* Instructional materials must conform to the policies of the California State Board of Education and to other applicable state and federal

requirements regarding diverse populations and students with special needs. To be considered suitable for adoption, instructional materials in mathematics must provide these essential components:

1. Comprehensive guidance and strategies, based on current and confirmed research, to adapt the curriculum to meet students' identified special needs and to provide effective, efficient instruction for all students. Strategies may include:

    - Suggestions that describe specific ways to address the learning needs of benchmark, strategic, or intensive students (as defined in Chapter 6 of the *Mathematics Framework*)
    - Suggestions for reinforcing or expanding the curriculum to meet the needs of benchmark, strategic, and intensive students (as defined in Chapter 6 of the *Mathematics Framework)* and for grouping students within or across grade levels to accommodate a wide range of achievement levels
    - Additional instructional time and additional practice, especially in key standards, including specialized teaching methods or materials and accommodations for students with special needs
    - Special help for students who are below grade level, including more explicit explanations with ample opportunities for review and practice, or other assistance that will help to accelerate student performance to grade level

2. Suggestions on how to help strategic or intensive students learn the key concepts in mathematics in the basic program while providing them with access to grade-level content.
3. In the basic program, teacher and student editions that include alternatives for advanced students that allow students to accelerate beyond their grade-level

content (acceleration) or to study the content in the California Mathematics Standards in greater depth or complexity (enrichment).

4. Instructional materials that are designed to help meet the needs of students whose reading, writing, listening, and speaking skills fall below grade level. Materials should help students understand and use appropriate academic language in mathematics.
5. Evidence of adherence to the Design Principles for Perceptual Alternatives, pursuant to *Education Code* Section 60061.8, as described in Appendix F.

Category 5: Instructional Planning and Support

Instructional materials must contain a clear road map for teachers to follow when planning instruction. The materials should be designed to help teachers implement a mathematics program that ensures opportunities for all students to learn the essential skills and knowledge called for in the California Mathematics Standards and *Mathematics Framework.* To be considered suitable for adoption, instructional materials in mathematics must provide these essential components:

1. A teacher's edition that includes ample and useful annotations and suggestions on how to present the content in the student edition and the ancillary materials.
2. A checklist of lessons in the teacher's edition, cross-referencing the standards covered and detailing the time necessary for instruction.
3. Lesson plans, including suggestions for organizing resources in the classroom and for pacing lessons. Pacing plans should allow for instruction at a reasonable pace and give particular attention to topics emphasized in the framework.

4. Clear, grade-appropriate explanations of mathematics concepts in a form that teachers can easily adapt for classroom presentation.
5. Strategies to anticipate, identify, address, and correct common student errors and misconceptions.
6. A system for accelerating or decelerating the rate at which new material is introduced to students in a manner suited to students' ability to assimilate new material.
7. Different kinds of lessons and alternative ways in which to explain concepts, offering teachers choice and flexibility in implementing the program.
8. Prioritization of critical components of lessons. Learning objectives and instruction are explicit, and the relationship of lessons to standards or skills within standards is explicit.
9. Review and practice problems, as described in Chapter 4 of the *Mathematics Framework,* which are distributed in the program to enhance student understanding and promote generalization and transfer of skills and knowledge.
10. Materials designed to help teachers identify the reason that students may find a particular type of problem more challenging than another (e.g., identify component skills not mastered) and to point to specific remedies.
11. Standards-based goals that are explicitly and clearly associated with instruction and assessment.
12. All components of the program so that there is little or no need for teachers to identify, gather, or develop supplementary materials. Blackline masters are designed to minimize dark areas on a page so that toner is not wasted during photocopying. Answer keys are provided for all workbooks and other related student activities.

13. All required manipulatives or suggestions for inexpensive alternatives. Manipulatives must be designed to promote student learning consistent with the California Mathematics Standards, and clear instructions must be provided for their efficient use.
14. For a basic program, a teacher's edition that explains the role of the specific grade-level mathematics in the context of the overall mathematics curriculum for kindergarten through grade twelve.
15. A teacher's edition that contains full, adult-level explanations and examples of the more advanced mathematics concepts in the lessons so that teachers can improve their own knowledge of the subject, as necessary.
16. Charts of the cost of staff development services and the time necessary to prepare teachers for full implementation of the mathematics program
17. Technical support and suggestions for appropriate use of audiovisual, multimedia, and information technology resources associated with a unit.
18. Homework activities that extend and reinforce classroom instruction and provide additional practice of skills and development of concepts that have been taught (optional prior to grade three).
19. Strategies for informing parents or guardians about the mathematics program and suggestions for ways in which they can help support student achievement.
20. Intervention and algebra readiness programs must have suggestions for how to use the materials in different instructional settings. A key feature of these programs is the close link between diagnostic assessment and guidance on instruction. In particular, intervention programs must be guided by diagnostic assessments so that students can begin to make progress using the basic grade-level programs in the shortest possible time. Algebra readiness programs must provide diagnostic assessments on the foundational concepts and skills, and lessons that can be implemented in the classroom, as needed,

to rebuild the missing foundational content. Strategies included in Appendix E are as follows:

- Instructional materials for algebra readiness focus on a subset of standards. The specialized focus of this program is student mastery of arithmetic. It provides the opportunity for coverage of the specified standards in depth and support for a variety of instructional strategies, including various ways to explain a concept and to develop student's conceptual understanding.
- Instructional materials prioritize the concepts and skills to be taught so that the teacher can make optimal use of time and resources.
- Instructional materials provide an adequate sample of the range of examples that illustrate each concept.
- Instructional materials include extensive diagnostic components to guide instruction. Diagnosis may often apply to the many smaller, embedded concepts and skills and not to a whole standard.
- Instructional materials reflect the interests of the students at their current ages
- Instructional materials provide assistance in the specialized vocabulary of mathematics and the academic language of instruction, including instructional strategies in the teacher's edition for approaches appropriate for English learners.